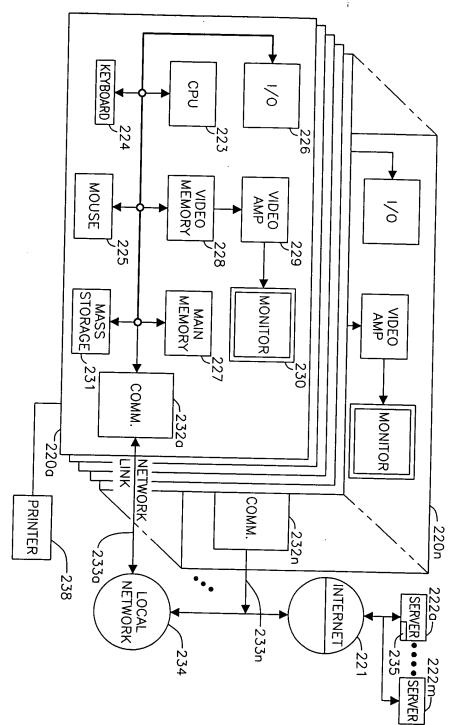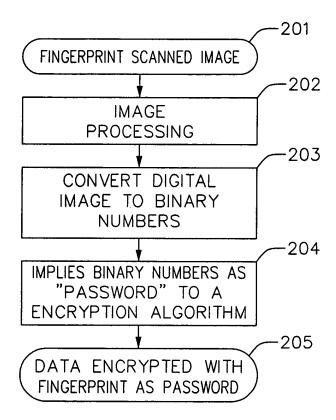Attorney: Raymond R. Tabandeh
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Inventor(s): Young Wan Kim
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FIG.1

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FIG.2

FINGERPRINT SCANNED IMAGE ⎯201

↓

IMAGE
PROCESSING ⎯202

↓

CONVERT DIGITAL
IMAGE TO BINARY
NUMBERS ⎯203

↓

IMPLIES BINARY NUMBERS AS
"PASSWORD" TO A
ENCRYPTION ALGORITHM ⎯204

↓

DATA ENCRYPTED WITH
FINGERPRINT AS PASSWORD ⎯205

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FIG.3

CUSTOMER APPLY FOR SERVICE ⟵ 302

↓

IDENTIFICATION CHECK ⟵ 304

↓

FINGERPRINT SCANNING UNIT AND ENCRYPTION SOFTWARE SENT TO APPLICANT ⟵ 306

↓

APPLICANT SENT ENCRYPTED FINGERPRINT MINUTIAE TO SECURED DATA CENTRE ⟵ 308

⟶ PAYLOAD ENCRYPTED WITH HARDCODED PRIVATE KEY ⟵ 310 ⟶ SECURED DATA CENTRE ⟵ 312

↓

AFTER SUCCESSFUL LOGIN USING REGISTERED FINGERPRINT, APPLICANT THEN INPUT AUTHORIZATION FINGERPRINT SEQUENCE ⟵ 318

⟶ PAYLOAD(BANK INFO.) ENCRYPTED WITH AUTHORIZATION FINGERPRINT MINUTIAE AS PRIVATE KEY. ⟵ 314 ⟶ ENCRYPTED BANKING INFO. STORAGE ⟵ 316

↓

REGISTRATION COMPLETED ⟵ 320

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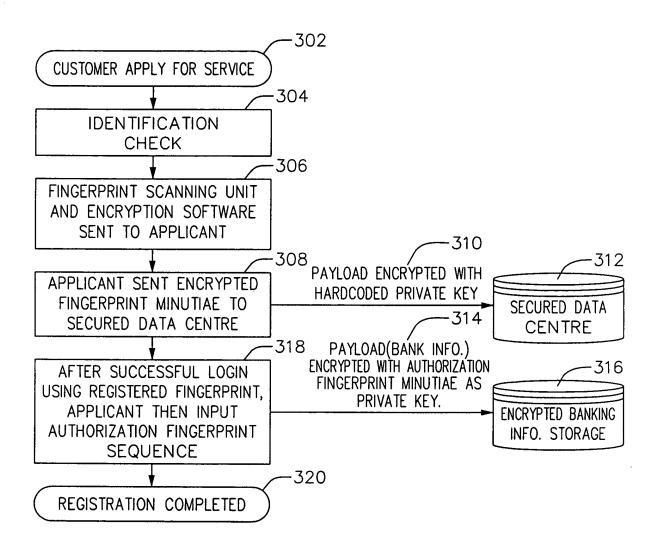SECURE CREDIT TRANSACTION PROCESSING
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FIG.4

MOBILE DEVICE   PERSONAL COMPUTER   POINT OF SALES

—420   —422   —424

FINGERPRINT READER

—426

CUSTOMER PERFORM A PURCHASE/ PAYMENT OPTION

CUSTOMER INPUT USER ID AND LOGIN FINGERPRINT SCAN — 402

POPUP SCREEN SHOWING AVAILABLE CREDIT CARD TO CHOOSE FOR PAYMENT — 404

CUSTOMER CHOOSE CREDIT/DEBIT CARD TO BE CHARGED TO AND SUBMIT AUTHORIZATION FINGERPRINT SEQUENCE — 406

CREDIT CARD INFORMATION THEN SENT TO MERCHANT BANK FOR CREDIT CLEARANCE — 408

MERCHANT BANK PROCESS REQUEST AND RETURN APPROVAL CODE — 410

SYSTEM NOTIFY CUSTMER OF PURCHASE ACTION WITH PREDIFINED NOTIFICATION METHOD — 412

APPROVAL CODE RETURN TO CUSTOMER. TRANSACTION COMPLETED — 414

—418

MATCHING SERVER

—416

SECURE RELAY DATA CENTRE

SECURE RELAY DATA CENTRE

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FIG.5

502 — ON-LINE CUSTOMER CHOOSE MT PAYMENT METHOD FROM CHECKOUT PAGE OF MERCHANT SITE

504 — CUSTOMER KEY IN USER ID AND LOGIN FINGERPRINT SCAN

505 — USER ID ENCRYPTED WITH LOGIN FINGERPRINT MINUTIAE

506 — SECURED RELAY DATA CENTRE DISPLAY POSSIBLE CHOICES OF CREDIT CARD

508 — CUSTOMER CHOOSE CREDIT CARD AND INPUT AUTHORIZATION FINGERPRINT SEQUENCE, MERCHANT SITE THEN TRANSMIT PURCHASE DETAIL

509 — ENCRYPTED WITH MERCHANT'S PRIVATE KEY

510 — SECURED RELAY DATA CENTRE LOOKUP CREDIT CARD INFO. AND SENT PROCESSING TO MERCHANT BANK

512 — MERCHANT BANK PROCESS REQUEST AND RETURN APPROVAL CODE TO SECURED RELAY DATA CENTRE

516 — PURCHASE DETAIL RETURNED TO MERCHANT SITE

514 — NOTIFY CUSTOMER WITH PURCHASE DETAIL

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PERSONAL
COMPUTER

604

632

MOBILE
DEVICE

POS
DEVICE

602

MODEM

630

MERCHANT

606   608   606

LOCAL
ISP

COMMUNICATION
TOWER

ON–LINE
SHOPPING
MALL

MOBILE
ISP

TRANSACTION
NOTIFICATION

610a

ENCRYPTED BANKING
INFO. STOTAGE

FIRST   610a   SECOND   610b
FIREWALL   FIREWALL

610

MATCHING

RELAY DATA
CENTER

TERMINAL
SERVER

612

NOTIFICATION
SERVER

COMMUNICATION
CENTRE

MODEM

SECURE RELAY
DATA CENTRE

614

MODEM

MERCHANT
BANK
SYSTEM

MERCHANT
BANK
SYSTEM

FINANCIAL
NETWORK

620

MERCHANT
BANK SITE

FIG.6

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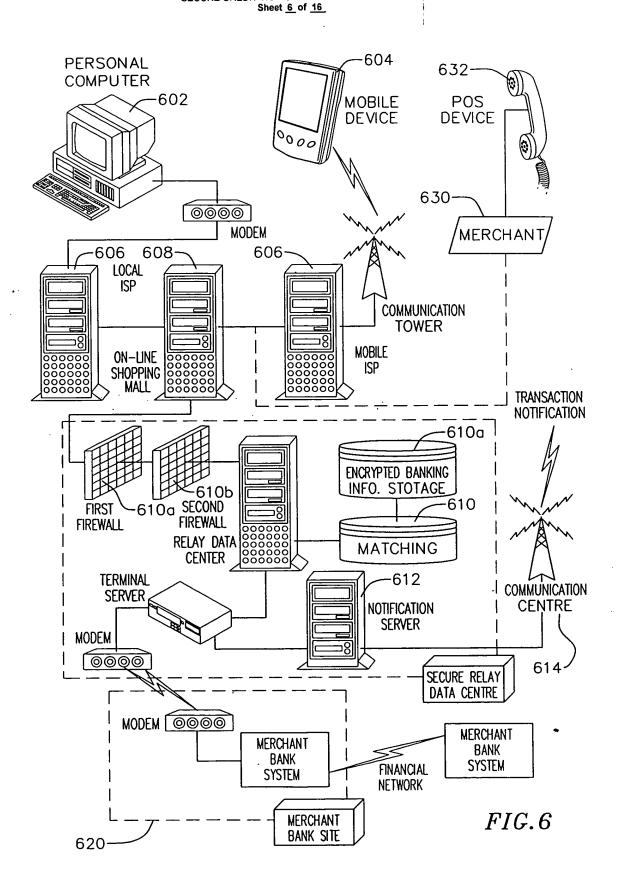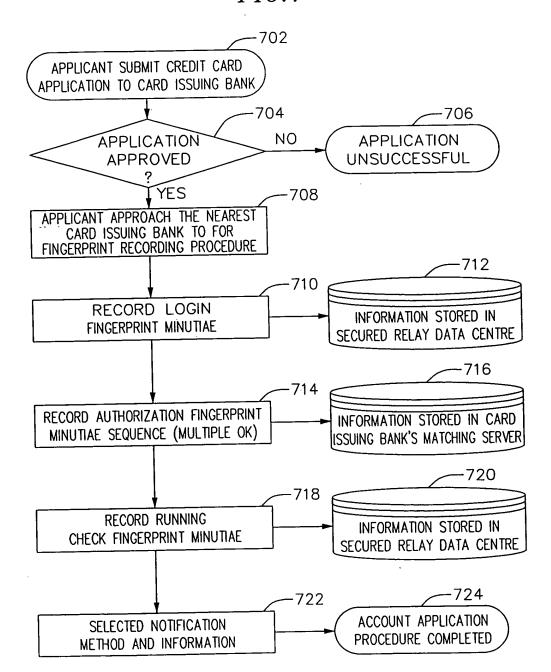Inventor(s): Young Wan Kim
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FIG.7

702
APPLICANT SUBMIT CREDIT CARD
APPLICATION TO CARD ISSUING BANK

704
APPLICATION
APPROVED
?

NO → 706
APPLICATION
UNSUCCESSFUL

YES

708
APPLICANT APPROACH THE NEAREST
CARD ISSUING BANK TO FOR
FINGERPRINT RECORDING PROCEDURE

710
RECORD LOGIN
FINGERPRINT MINUTIAE

→ 712
INFORMATION STORED IN
SECURED RELAY DATA CENTRE

714
RECORD AUTHORIZATION FINGERPRINT
MINUTIAE SEQUENCE (MULTIPLE OK)

→ 716
INFORMATION STORED IN CARD
ISSUING BANK'S MATCHING SERVER

718
RECORD RUNNING
CHECK FINGERPRINT MINUTIAE

→ 720
INFORMATION STORED IN
SECURED RELAY DATA CENTRE

722
SELECTED NOTIFICATION
METHOD AND INFORMATION

→ 724
ACCOUNT APPLICATION
PROCEDURE COMPLETED

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FIG.8

802

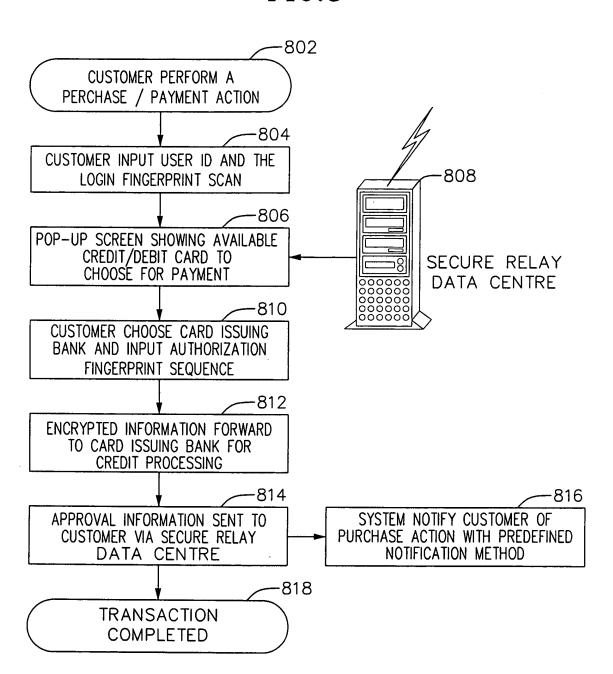CUSTOMER PERFORM A
PERCHASE / PAYMENT ACTION

↓

804

CUSTOMER INPUT USER ID AND THE
LOGIN FINGERPRINT SCAN

↓

806

POP-UP SCREEN SHOWING AVAILABLE
CREDIT/DEBIT CARD TO
CHOOSE FOR PAYMENT

808

SECURE RELAY
DATA CENTRE

↓

810

CUSTOMER CHOOSE CARD ISSUING
BANK AND INPUT AUTHORIZATION
FINGERPRINT SEQUENCE

↓

812

ENCRYPTED INFORMATION FORWARD
TO CARD ISSUING BANK FOR
CREDIT PROCESSING

↓

814

APPROVAL INFORMATION SENT TO
CUSTOMER VIA SECURE RELAY
DATA CENTRE

→

816

SYSTEM NOTIFY CUSTOMER OF
PURCHASE ACTION WITH PREDEFINED
NOTIFICATION METHOD

↓

818

TRANSACTION
COMPLETED

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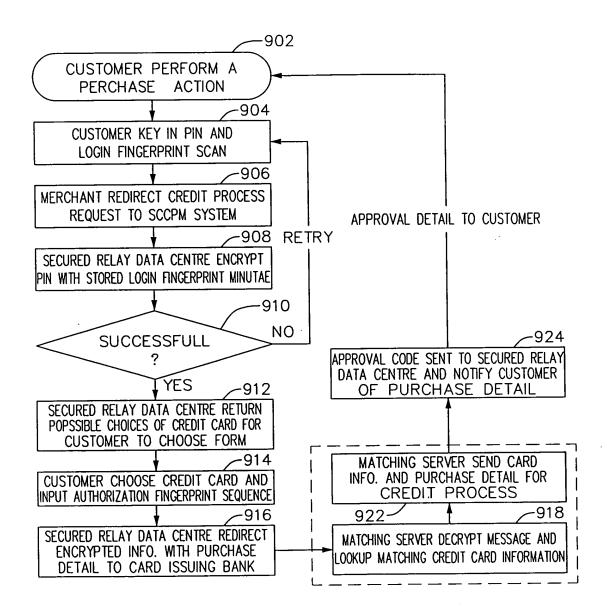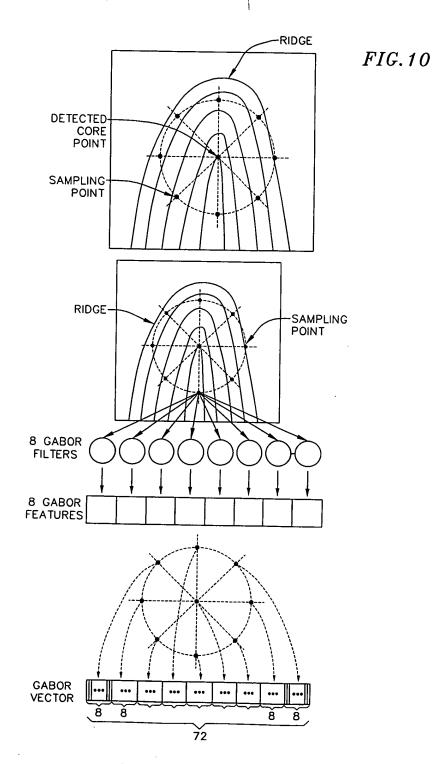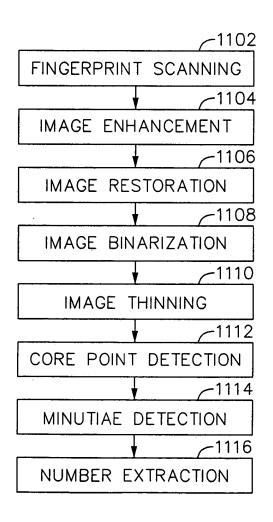SECURE CREDIT TRANSACTION PROCESSING
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FIG.9

```
                                              ┌─902
                    ┌──────────────────────────┐
                    │   CUSTOMER PERFORM  A     │◄─────────────────────────┐
                    │   PERCHASE   ACTION       │                          │
                    └──────────────────────────┘                          │
                              │        ┌─904                               │
                    ┌──────────────────────────┐                          │
                    │  CUSTOMER KEY IN  PIN AND │◄───────────┐            │
                    │  LOGIN FINGERPRINT SCAN   │            │            │
                    └──────────────────────────┘            │            │
                              │        ┌─906                 │            │
                    ┌──────────────────────────┐            │            │
                    │ MERCHANT REDIRECT CREDIT PROCESS│      │            │
                    │  REQUEST TO SCCPM SYSTEM   │           │  APPROVAL DETAIL TO CUSTOMER
                    └──────────────────────────┘            │            │
                              │        ┌─908  RETRY          │            │
                    ┌──────────────────────────┐            │            │
                    │ SECURED RELAY DATA CENTRE ENCRYPT│     │            │
                    │PIN WITH STORED LOGIN FINGERPRINT MINUTAE│           │
                    └──────────────────────────┘            │            │
                              │        ┌─910                 │            │
                         ╱────────────╲  NO                  │     ┌─924  │
                        ╱ SUCCESSFULL  ╲─────────────┐       │  ┌──────────────────────────┐
                        ╲      ?       ╱             └───────┘  │APPROVAL CODE SENT TO SECURED RELAY│
                         ╲────────────╱                         │DATA CENTRE AND NOTIFY CUSTOMER│
                              │ YES    ┌─912                    │  OF  PURCHASE  DETAIL     │
                    ┌──────────────────────────┐               └──────────────────────────┘
                    │ SECURED RELAY DATA CENTRE RETURN│                   ▲
                    │POPSSIBLE CHOICES OF CREDIT CARD FOR│                │
                    │  CUSTOMER  TO CHOOSE FORM  │                        │
                    └──────────────────────────┘         ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
                              │        ┌─914             │ ┌──────────────────────────┐  │
                    ┌──────────────────────────┐         │ │ MATCHING SERVER SEND CARD │ │
                    │ CUSTOMER CHOOSE CREDIT CARD AND│   │ │ INFO. AND PURCHASE DETAIL FOR│ │
                    │INPUT AUTHORIZATION FINGERPRINT SEQUENCE│ │   CREDIT  PROCESS      │  │
                    └──────────────────────────┘         │ └──────────────────────────┘  │
                              │        ┌─916             │  922─┘       ▲       ┌─918     │
                    ┌──────────────────────────┐         │ ┌──────────────────────────┐  │
                    │ SECURED RELAY DATA CENTRE REDIRECT│ │MATCHING SERVER DECRYPT MESSAGE AND│
                    │ ENCRYPTED INFO. WITH PURCHASE │───┼►│LOOKUP MATCHING CREDIT CARD INFORMATION│
                    │ DETAIL TO CARD ISSUING BANK │     │ └──────────────────────────┘  │
                    └──────────────────────────┘        └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```

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Inventor(s): Young Wan Kim
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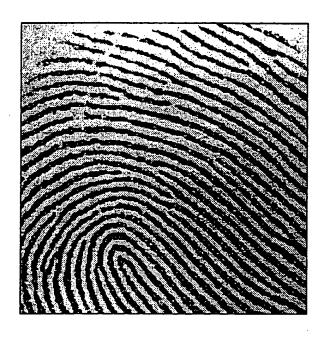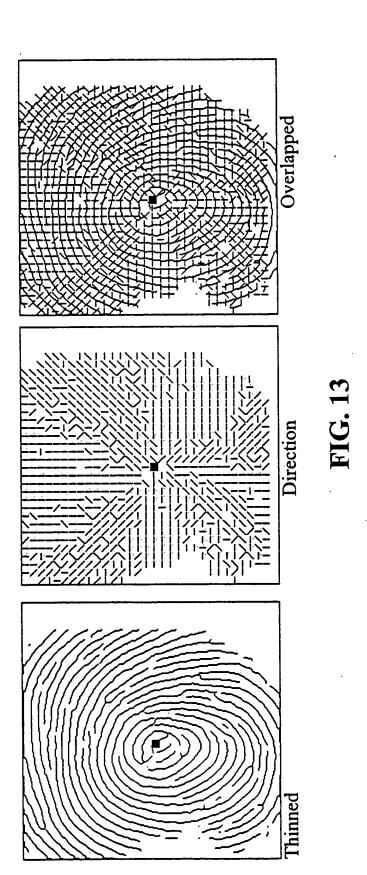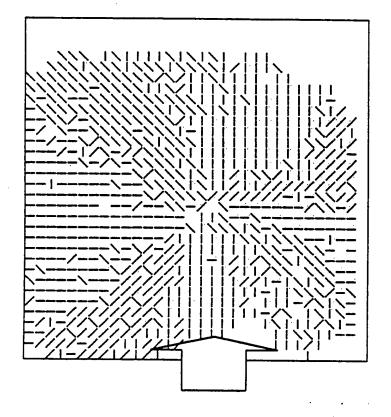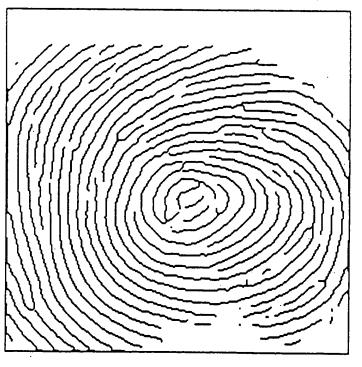SECURE CREDIT TRANSACTION PROCESSING
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FIG.10

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FIG.11
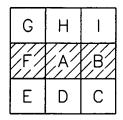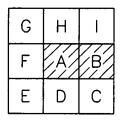
1102
┌─────────────────────────────┐
│   FINGERPRINT SCANNING   │
└─────────────────────────────┘
              │
              ▼ 1104
┌─────────────────────────────┐
│   IMAGE ENHANCEMENT   │
└─────────────────────────────┘
              │
              ▼ 1106
┌─────────────────────────────┐
│   IMAGE RESTORATION   │
└─────────────────────────────┘
              │
              ▼ 1108
┌─────────────────────────────┐
│   IMAGE BINARIZATION   │
└─────────────────────────────┘
              │
              ▼ 1110
┌─────────────────────────────┐
│   IMAGE THINNING   │
└─────────────────────────────┘
              │
              ▼ 1112
┌─────────────────────────────┐
│   CORE POINT DETECTION   │
└─────────────────────────────┘
              │
              ▼ 1114
┌─────────────────────────────┐
│   MINUTIAE DETECTION   │
└─────────────────────────────┘
              │
              ▼ 1116
┌─────────────────────────────┐
│   NUMBER EXTRACTION   │
└─────────────────────────────┘

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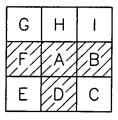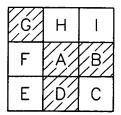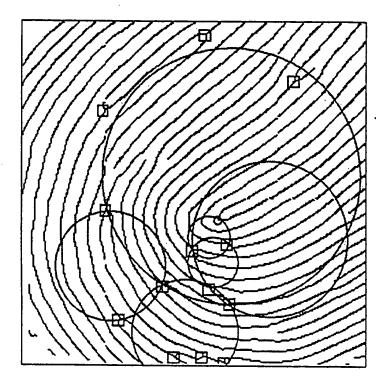Sheet 12 of 16

FIG. 12A

FIG. 12B

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Thinned

Direction

Overlapped

FIG. 13

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Fig. 14B

Fig. 14A

FIG.15A

G	H	I
F	A	B
E	D	C

FIG.15B

G	H	I
F	A	B
E	D	C

FIG.15C

G	H	I
F	A	B
E	D	C

FIG.15D

G	H	I
F	A	B
E	D	C

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Inventor(s):   Young Wan Kim
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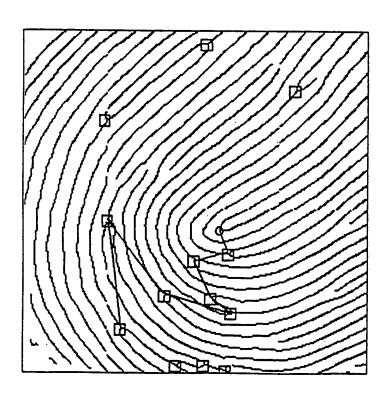SECURE CREDIT TRANSACTION PROCESSING
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FIG. 16B

FIG. 16A